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09/475,487	12/30/1999	AZAR ASSADI	042390.P6880	6378

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Farzad E Amini
Blakely Sokoloff Taylor & Zafman LLP
12400 WILSHIRE BOULEVARD SEVENTH FLOOR
LOS ANGELES, CA 90025

EXAMINER

MYERS, PAUL W

ART UNIT	PAPER NUMBER
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2612

DATE MAILED: 02/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/475,487

Applicant(s)

ASSADI, AZAR

Examiner

Paul W Myers

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 December 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other:

Response to Amendment

1. Applicant's arguments filed 11-03-03 have been fully considered but they are not persuasive.

a. In regard to the argument analogous art, the applicant argues that it would have not been obvious to modify Murakami and Shigeta with Farn because Murakami and Shigeta are directed to image sensing devices and Farn is directed to a display device. The MPEP in section 2141.01(a), Titled: Analogous and Nonanalogous Art, details that "In order to use a rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, **reasonably pertinent to the particular problem with which the inventor was concerned.**" The examiner has determined that the Farn reference fully meets the requirements of the latter of the two. The applicant's on page 9 lines 5- 12 of the specification details that invention deals with dispersion of light inherent to a diffraction grating. The applicant on page 9 lines 5-12 of the specification further correctly details that Farn, M. W. in the article "Color Separation by use of Binary Optics" details the use of grating for the separation of color in the visible light spectrum. The Farn reference used by the examiner also deals with diffractive grating used for the separation of light as detailed in the abstract of the Farn Reference. It is notoriously well-know in the art of display devices that diodes with a protective layer are used to form pixels. The use of diodes

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with protective layers is illustrated by US Patent No. 5,056,894 to Kuijk et al. Kuijk in column 3 lines 32-42 details that the display pixel has a diode (7) and a protective layer (16). In view of the above, the Examiner believes that the broadest interpretation of the present claimed invention does read on the cited references for at least the reasons discussed above and as stated in the detail office action as follows. The rejection of claims 1-16 is maintained.

DETAILED ACTION

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. Claims 1-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. 2003/0138988 to Murakami et al in view of U.S. Patent No. 5,976,907 to Shigeta et al in further view of U.S. Patent No. 5,682,265 to Farn et al.

a. In regard to claim 1, 9 and 13 Murakami on page 4 paragraphs [0043], [0044] and figure 2 detail and integrated pixel sensor consisting of a light sensitive diode (4 and 5) including a transparent conductor (1). Murakami further teaches that a protective layer (8 and 9) is placed above the transparent conductor (1).

Murakami does not disclose protective layer including a set of diffraction grating elements for producing complementary colors.

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However, Shigeta in column 6 line 55 to column 7 line 4 details a protective layer (30 and 15) that has color filters (14) disposed within the protective layer (30 and 15) capable of producing complementary colors.

It would have been obvious to anyone of ordinary skill in the art at the time of the invention to combine Murakami's image sensing device with Shigeta's color filters to produce an image sensor capable of sensing complementary colors.

Shigeta does not disclose a set of diffraction grating elements.

However, Farn in column 2 lines (60-67) and figure 1 detail a diffraction grating that is capable of producing complementary colors. Farn in column 1 lines 29-35 teaches that color filters only allow light associated with one of the three complementary colors to pass.

It would have been obvious to anyone of ordinary skill in the art at the time of the invention to combine Murakami's image sensing device and Shigeta's color sensing device with Farn's diffraction grating to separate visible light into its primary color bands.

b. In regard to claims 2, 6, 10 and 14, Murakami in figure two details a protective layer (8 and 9) that includes anti-reflection properties (8).

b. In regard to claim 3, 7, 11 and 15, Murakami's on page 2 paragraph [0012] details that his invention relates to a device and method of manufacturing a Solid-State Imaging Device. Any of the materials used to manufacture Murakami's device including the

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materials used for the protective layer would be suitable for the fabrication process.

Farn in column 4 line 41 details that the grating was made from silica (i.e. the protective layer is compatible with the protective layer and is a material suitable for use with metal oxide semiconductor fabrication process). Official Notice is taken that Silica is defined as silicon dioxide or SiO₂, and is manufactured in the form of glass or silica gel. SPIE web in OE Reports 167, dated November 1997, details that sol-gel silica glass is used in integrated optics (See attached Encyclopedia Wikipedia & SPIE)

c. In regard to claim 4, 8, 12 and 16, Farn in figure 1 shows a four step echelon grating element.

d. In regard to claim 5, Murakami fails to teach a post capture signal processing unit coupled to the integrated pixel sensor. Official Notice is taken that both the concept and the advantages of providing signal processing in a camera are well known and expected in the art. It would have been obvious to have couple a signal processing unit to the integrated pixel sensor to process and manipulate the incoming signals from the integrated pixel sensor in order to help facilitate the use of the incoming information. For further information regarding the limitations set forth in claim 5, refer to examiners notes for claim 1.

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2. Claims 17-19 and 21-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over US006501065B1 Uppal et al in view of US 20030138988A1 to Murakami et al in view of US005600486A to Gal et al.

e. In regard to claim 17, Uppal in column 3 line 49 details that his image sensor has a conductive region (14) (i.e. metallization layer). Figure 4 shows that the conductive region (14) is formed below the pin diode (i.e. light-sensitive diodes). Uppal further details that the n layer (20), intrinsic layer (21) and p layer (22) are all made from amorphous silicon. Uppal in column 5 lines 16-31 details that there is a transparent conductive layer (27) and it is made from indium tin oxide (ITO).

Uppal fails to explicitly state a protective layer of the die, wherein the protective layer is to protect the plurality of diodes and is shaped as a diffraction grating.

However, Murakami on page 4 paragraphs [0043] and [0044] teaches that a protective layer (8 and 9) is placed above the transparent conductor (1).

Therefore, it would have been obvious to anyone of ordinary skill in the art at the time of the invention to combine Uppal's pin diode structure with Murakami's protective layer to protect the image sensing components.

Uppal and Murakami fail to explicitly state the protective layer is shaped as a diffraction grating.

However, Gal in column 2 lines 56-67 details that grating can be used to separate colors of a spectral band by diffraction.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the Uppal's and Murakami teaching of a photodiode and protective layer with Gal's grating in order to produce an image sensor that can separate light into its color components.

f. In regard to claim 18 and 19, refer to examiner's notes for claim 17.

g. In regard to claim 21, refer to examiner's notes for claim 17.

h. In regard to claim 22, Uppal in column 5 lines 16-31 details that there is a transparent conductive layer (27) that is placed above the photodiode. Murakami on page 4 paragraphs [0043], [0044] and figure 2 teaches that a protective layer (9) is placed above the transparent conductor (1). It is inherent that the protective layer has a low enough deposition temperature so as not to environmentally stress the transparent conductor or else the invention could not be manufactured.

i. In regard to claim 23, Murakami in figure two details a protective layer (8 and 9) that includes anti-reflection properties (8 and 9).

j. In regard to claim 24, Uppal in column 11 lines 6-10 details the grating can produce RGB colors. Uppal in figure 2 shows that the grating imparts the separated color components onto the respective portions of the image sensing area of the die.

k. In regard to claim 25, the reference discloses grating used for separating colors, however it is silent as to whether the protective layer is formed from sol-gel. Nevertheless, the Official Notice is taken that it was notoriously well-known in the art at the time of the invention to employ sol-gel to form a protective layer, and it would have been clearly obvious to one of ordinary skill in the art at the time of the invention to use sol-gel because of its abilities to transmit light.

l. In regard to claim 26, Uppal in the abstract details that his invention deals with a CMOS image sensor (i.e. it is compatible with (MOS) manufacturing.)

3. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over US006501065B1 Uppal et al in view of US 20030138988A1 to Murakami et al in view of US005600486A to Gal et al in view of US006163386A to Kobayashi et al.

m. In regard to 20, Uppal, Murakami and Gal detail a pin diode. Further details refer to examiner's notes for claim 17.

Uppal, Murakami and Gal fail to explicitly state the n and p portions of the n-i-p structure are thin relative to the intrinsic portion.

Kobayashi in column 6 lines 3-7 and figure 1A shows that the p layer (3) and the n layer (4) are thin relative to the intrinsic layer (4). Kobayashi in column 6 lines 19-21

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details that the light entering the diode is absorbed by the intrinsic layer, producing electron hole pairs.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combined Uppal's, Murakami's and Gal's pin diode with Kobayashi's thicker intrinsic layer in order increase the amount of photosensitive area in order to more effectively use the pixel area.

Conclusion

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- n. US005408343A to Sugiura et al for the use of a grating in an image sensor.
- o. US006353228B1 to Itabashi for a transparent conductor made of (ITO) indium tin oxide and a pin photodiode.
- p. US 5,056,894 to Kuijk details that LCD display devices use diode and protective layers that are compatible with semiconductor manufacturing.
- q. SPIE Web OP Reports, November 1997 for using sol-gel for grating and that sol-gel is silica.
- r. Dictionary onelook.com for the definition of silica
- s. Encyclopedia Wikipedia for the definition and uses of silica.
- t. Dictionary onelook.com for the definition of indium tin oxide.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul W Myers whose telephone number is (703) 305 4039. The examiner can normally be reached on Mon-Fri 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wendy Garber can be reached on (703) 305 4929. The fax phone number for the organization where this application or proceeding is assigned is (703) 872 9314.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 306 0377.

PWM
PWM


NGOC-YEN VU
PRIMARY EXAMINER